

## Claims

### What is claimed is:

- 1     **1.** A keep-warm system for a fuel cell power plant **(10)**,  
2     comprising:
  - 3         a. a fuel cell stack assembly (CSA) **(12 )**  
4         including an anode **(16 )**, a cathode **(18 )**, an  
5         electrolyte **(14 )**, and a cooler **(20 )** ;
  - 6         b. fuel supply means **(25 )** for providing a supply  
7         of fuel, at least some of the fuel being supplied as  
8         reactant to the anode **(16 )** ;
  - 9         c. a source of oxidant reactant **(22 )** operatively  
10        supplied to the cathode **(18 )** ;
  - 11        d. a water management system **(30, 28 )**  
12        operatively connected to the cooler **(20 )** of the CSA  
13        **(12 )** ;
  - 14        e. thermal insulating means **(64 )** enclosing at  
15        least one of the CSA **(12 )** and the water management  
16        system **(30, 28 )** for providing thermal insulation  
17        thereof; and
  - 18        f. catalytic fuel burner means **(66 )**  
19        operatively connected to the fuel supply means **(25 )**  
20        and to the source of oxidant reactant **(22)** for  
21        catalytically reacting the fuel and oxidant and  
22        providing a source of heat, the burner means **(66 )**  
23        being disposed and operative to supply heated gas into  
24        the thermal insulating enclosure means **(64)**, and to the  
25        at least one of the CSA **(12 )** and the water management  
26        system **(30, 28 )** in the thermal insulating enclosure  
27        means **(64 )** .
- 1     **2.** The keep-warm system of claim 1 wherein the  
2     catalytic burner means **(66)** includes a catalytic  
3     surface **(72)** for combustively reacting the fuel in the

4 presence of oxidant in a flameless manner to release  
5 heat only in a thermal range less than about 1000<sup>0</sup> F.

1 3. The keep-warm system of claim 2 wherein the heat  
2 released by catalytic combustion at the catalytic  
3 burner means (66) is in the thermal range of about  
4 200<sup>0</sup>-700<sup>0</sup> F.

1 4. The keep-warm system of claim 2 wherein the source  
2 of oxidant reactant (22) is ambient air, the air being  
3 supplied to the catalytic burner means (66) and mixed  
4 with fuel from the fuel supply means (25) for  
5 combustively reacting the mixture in the presence of  
6 the catalytic surface (72) to release heat.

1 5. The keep-warm system of claim 1 wherein the fuel  
2 supply means (25) comprises a container of hydrogen  
3 stored under pressure.

1 6. The keep-warm system of claim 1 wherein both the CSA  
2 (12) and the water management system (28, 30) are  
3 substantially enclosed by the thermal insulating means  
4 (64).

1 7. The keep-warm system of claim 4 wherein the  
2 electrolyte (14) of the CSA (12) is a proton exchange  
3 membrane (PEM), the fuel from the fuel supply means  
4 (25) is hydrogen, and the heat released by catalytic  
5 combustion at the catalytic burner means (66) is in  
6 the thermal range of about 200<sup>0</sup> - 700<sup>0</sup> F.

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1 8. In a fuel cell power plant (10) having a fuel cell  
2 stack assembly (CSA) (12) including an anode (16), a  
3 cathode (18), an electrolyte (14), and a cooler (20), a  
4 fuel supply (25) for providing fuel to at least the

5 anode (16), a source of oxidant reactant (22) for  
6 supplying at least the cathode (18), and a water  
7 management system (30, 28) operatively connected to the  
8 cooler (20) of the CSA (12), the method of preventing  
9 freezing of water in freeze-sensitive parts of the fuel  
10 cell power plant (10) during shutdown, comprising the  
11 steps of:

12 a. selectively flowing (62, 63, 69, 67) fuel (25)  
13 and oxidant (22) to a catalytic fuel burner (66) during  
14 shutdown for catalytic combustion to provide heated  
15 gas;

16 b. convectively flowing the heated gas into heat  
17 transfer relation with the freeze-sensitive parts of  
18 the fuel cell power plant (10) to provide heat thereto;  
19 and

20 c. thermally insulating the freeze-sensitive  
21 parts of the fuel cell power plant (10) including the  
22 heated gas flowing in heat transfer relation therewith.